

A taxonomic revision of the family Oncopodidae V. *Gnomulus* from Vietnam and China, with the description of five new species (Opiliones, Laniatores)

Peter J. SCHWENDINGER¹ & Jochen MARTENS²

¹ Muséum d'histoire naturelle, case postale 6434, CH-1211 Genève 6, Switzerland.

² Institut für Zoologie, Johannes Gutenberg-Universität Mainz, Saarstr. 21, D-55099 Mainz, Germany.

A taxonomic revision of the family Oncopodidae V. *Gnomulus* from Vietnam and China, with the description of five new species (Opiliones, Laniatores). - Five new *Gnomulus* species, *G. bedoharvengorum* (♂ ♀), *G. saetosus* (♂), *G. dalat* (♂ ♀), *G. lemniscatus* (♂ ♀) and *G. annamiticus* (♂ ♀), are described from Vietnam and placed in two species groups, one of them new. Additional specimens of *G. spiniceps* Schwendinger & Martens, 2002 from Vietnam and of *G. sinensis* Schwendinger & Martens, 2002 from China are reported and illustrated. Relationships and zoogeography are discussed.

Keywords: Taxonomy - *Gnomulus spiniceps* - *G. sinensis* - zoogeography.

INTRODUCTION

Opilionids of the family Oncopodidae were not known from Indochina until *Gnomulus spiniceps* Schwendinger & Martens, 2002 was described from a single male collected in the Cuc Phuong National Park in northern Vietnam. That specimen was made available by Dr Hirotsugu Ono (NSMT), who later sent us more fascinating oncopodid material from Vietnam.

After the description of *Gnomulus spiniceps* was published, Dr Anne Bedos and Dr Louis Deharveng (MNHN), who have previously provided a very rich oncopodid material for our ongoing revision of this family, sent us oncopodids (but unfortunately only females) from Hon Chong, southern Vietnam. One of us (PJS) then visited southern Vietnam in August and September 2003 with the aim to collect the corresponding male. PJS found oncopodids of both sexes at other localities in the region, but collecting by sifting organic matter around Hon Chong, with exact instructions from Bedos and Deharveng as to where they found the females before, however, failed to yield any additional material. It was Bedos, Deharveng and their Vietnamese colleague, Le Chong Man, who two weeks later handcollected a male specimen there and so enabled a proper description of this new species. Finding these obscure, and usually rare, opilionids is as much a matter of luck, as of experience and adequate collecting technique.

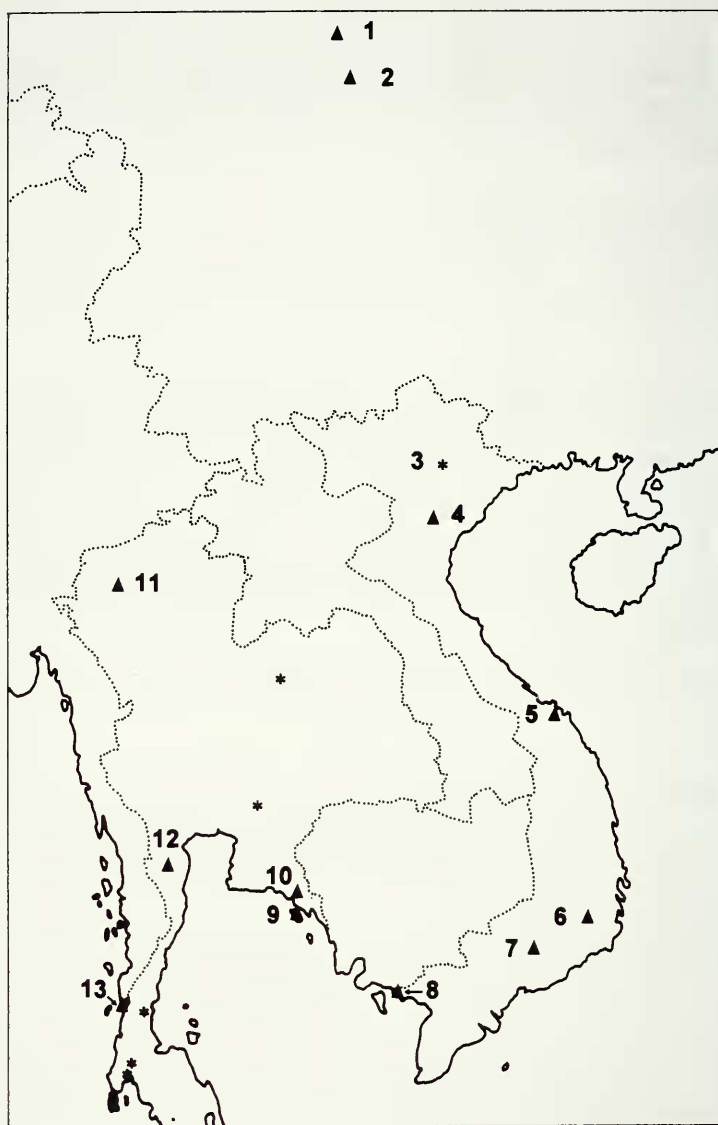


FIG. 1

Records of *Gnomulus* species in mainland Southeast Asia (not including Malaysia) and southern China. 1 Tuanjie Village (*G. sinensis* Schwendinger & Martens), 2 Omei Shan (*G. sinensis*), 3 Tam Dao (*Gnomulus* sp.), 4 Cuc Phuong (*G. spiniceps* Schwendinger & Martens), 5 Mount Bach Ma (*G. annamiticus* sp. n.), 6 Datanla Waterfall (*G. dalat* sp. n., *G. lemniscatus* sp. n.), 7 Cat Tien N. P. (*G. saetosus* sp. n.), 8 Hon Chong (*G. bedoharvengorum* sp. n.), 9 Ko Chang (*G. marginatus* Schwendinger & Martens), 10 Nam Tok Phliu N. P. (*G. marginatus*), 11 Doi Inthanon (*G. lannaianus* [Schwendinger]), 12 Kaeng Krachan N.P. (*G. ryssie* Schwendinger & Martens), 13 Maliwun (*G. leofeae* Schwendinger & Martens). Asterisks indicate localities of undescribed *Gnomulus* species.

Peter Jäger (SMF) recently collected and sent us additional specimens of *Gnomulus sinensis* Schwendinger & Martens from China, a species with close relationships to one of the Vietnamese oncopodids. The female of this species is here described for the first time.

MATERIAL AND METHODS

Body measurements refer to the dorsal scutum. Leg articles were measured on their dorsal side, from joint to joint. All measurements are given in mm. The leg formula is given from shortest to longest leg. The term "carapace-opisthosoma bridge" is here used instead of "carapace-abdomen bridge" (see Schwendinger & Martens, 1999: 946). Terminology of penis morphology follows Martens & Schwendinger (1998: fig. 1).

External structures were studied and drawn with a ZEISS SV11 stereomicroscope; penes, as temporary mounts embedded in glycerine, with a NIKON Optiphot compound microscope (each with a drawing tube).

In freshly killed males the penis can be extracted by gently pressing the opisthosoma dorsoventrally with forceps. In this way dissection by two parallel incisions behind the genital operculum (necessary for specimens hardened by preservation) can be avoided.

Abbreviations used in the text: MAR = collection of J. Martens, Mainz; MHNG = Muséum d'histoire naturelle, Genève; MNHN = Muséum National d'Histoire Naturelle, Paris; NHMW = Naturhistorisches Museum, Wien; NSMT = National Science Museum, Tokyo; SMF = Senckenberg Museum und Forschungsinstitut, Frankfurt a. M.

TAXONOMY

THE *ARMILLATUS*-GROUP

DIAGNOSIS: See Schwendinger & Martens (1999: 958; 2002: 66).

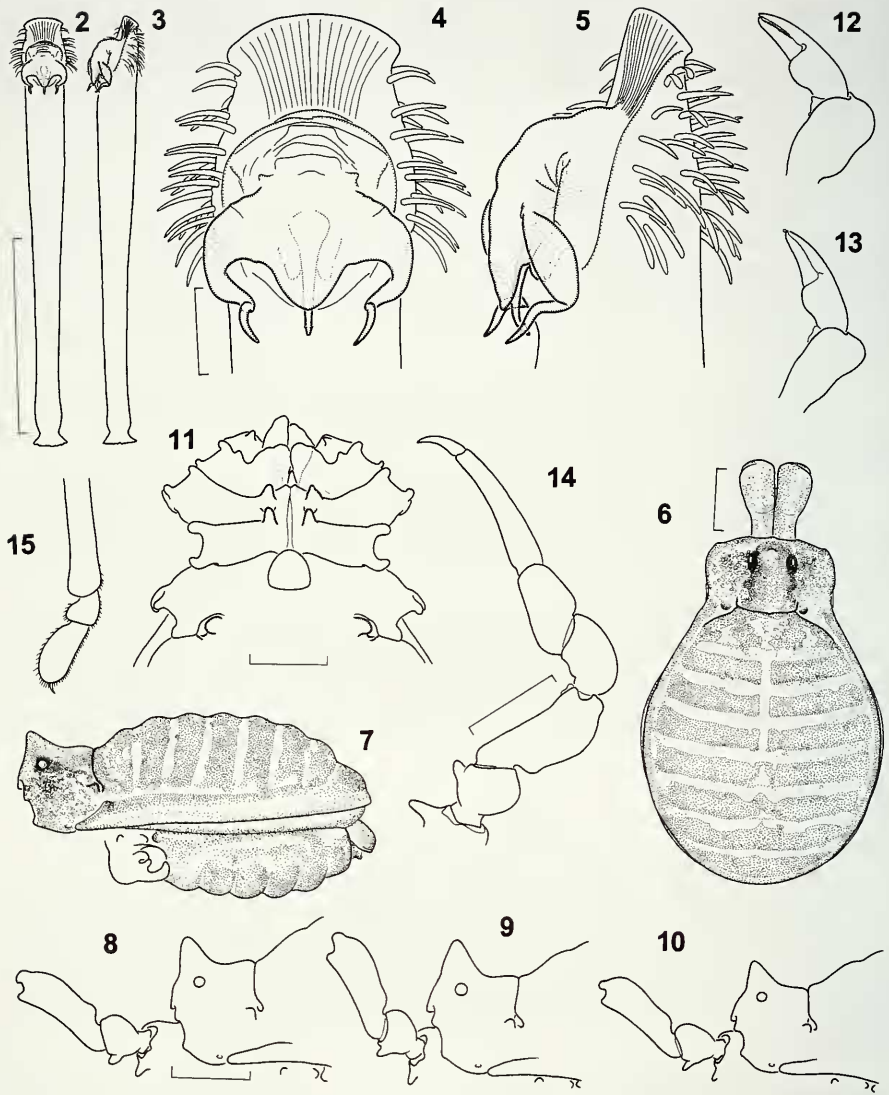
DISTRIBUTION AND SPECIES ACCOUNT: This species group is currently known from 21 species (see Schwendinger & Martens, 2002: 66; including the new species described in the following) occurring in southern Myanmar, Thailand, southern Vietnam and peninsular Malaysia, on Sumatra, Java, Borneo and the Philippine island of Palawan.

Gnomulus bedoharvengorum sp. n.

Figs 2-15

MATERIAL: VIETNAM (south), Kien Giang Province, Nui (= Mount) Hon Chong, about 3 km S of Hon Chong village (10°08'50"N, 104°37'10"E), 10 m, ♂ holotype, leg. Le Chong Man, 22.VIII.2003, sample Vn0308-089 (MHNG). – Nui Bai Voi (10°13'N, 104°37'E), ca. 7 km N of Hon Chong, 1 ♀ paratype ("allotype"), leg. A. Bedos & L. Deharveng, 23.VIII.2003, sample Vn0308-107 (MHNG). – Hang (= Cave) Quan Y (= Hang Mo So) (10°13'53"N, 104°36'59"E), Nui Bai Voi, 1 ♀ paratype, leg. A. Bedos, 29.I.2003, sample VIET-943 (MNHN). – Hang Tien, Nui Hang Tien (10°8'14"N, 104°38'56"E), ca. 3 km N of Hon Chong, 1 ♀ paratype, leg. A. Bedos & L. Deharveng, 28.I.2003, sample VIET-931 (MAR).

ETYMOLOGY: The species epithet is a compound word (noun in the genitive plural) taken from the names of Dr Anne Bedos and Dr Louis Deharveng (MNHN), who discovered this species and numerous other oncopodids, some still undescribed.



FIGS 2-15

Gnomulus bedoharvengorum sp. n., ♂ holotype (2-7, 11, 12, 14, 15), ♀ "allotype" (8, 13), ♀ paratypes (9, 10). – Penis, dorsal (2) and lateral view (3); apex of penis, dorsal (4) and lateral view (5). Body, dorsal (6) and lateral view (7); anterior part of body and proximal part of palp, lateral view (8-10); anterior part of body, ventral view (11); left chelicera, retrolateral view (12, 13); left palp, retrolateral view (14); distal part of left leg II, retrolateral view (15). Scale lines 0.1 mm (4, 5), 1.0 mm (all others).

DIAGNOSIS: Very similar to *G. marginatus* Schwendinger & Martens (2002: 66-71, figs 74-91), distinguished by: Body smaller in size; ground colour orange, dorsal pattern much lighter, no light submarginal band around opisthosoma region of dorsal

scutum; retroventral tooth on proximal article of chelicerae absent; penis more slender, its apex narrower and carrying fewer lateral setae; glans penis shorter and wider.

DESCRIPTION: ♂ (holotype). Colouration: Ground colour orange, with darker pattern on dorsal scutum (Figs 6, 7); dark transversal bands in areas II-IV fairly widely interrupted medially (Fig. 6); chelicerae, palps and legs gradually becoming lighter towards distal segments; leg tarsi I, II cream.

Carapace region with conical, pointed eye tubercle and with a pair of lateral tubercles posteriorly below wide, indistinctly divided carapace-opisthosoma bridge. Dorsal scutal areas only slightly elevated; ventral scutal areas swollen and pallid, no hairs present (Figs 6, 7). Palpal coxa with large ventral process; leg coxa I with distinct anterolateral process; ventral side of leg coxae II and III with large anteroproximal processes, indistinct posteroproximal process on coxa II overlapped by anteroproximal process of coxa III (Fig. 11); dorsal side of leg coxa IV with two knob-shaped tubercles; one more such tubercle posterior to them, on the lateral side of opisthosomal segment II (Fig. 7). Genital operculum somewhat rounded, about as wide as long; posterior margin of stigmatic pit with a large rounded tubercle (Fig. 11).

Chelicerae (Fig. 12): Hand weak; proximal article fairly strong, with dorsodistal to dorsomedian boss, without retroventral tooth.

Palps (Fig. 14): Femur with distinct dorsoproximal boss and indistinct, broadly rounded ventroproximal process; trochanter with small ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II about 2 times longer than wide (Fig. 15).

Penis (Figs 2-5): Truncus fairly slender, continuously widening from base to height of glans, with quite narrow and widely arched distal margin, and many subapical setae. Glans (Figs 4, 5) with tongue-shaped median plate completely covering small membranous tubes; lateral sclerites with moderately elevated dorsal ledge (visible in lateral view; Fig. 5) in proximal part, distal part slender, distinctly sigmoid, cylindrical, pointing away from the truncus, tapering tips of lateral sclerites widely apart; stylus slender, base bulbous, apex with a pair of small subterminal ventral teeth.

♀. As the male but dark bands in dorsal scutal areas I-IV less widely interrupted in the middle; carapace region of dorsal scutum slightly shorter; ventral scutal elevations not swollen and pallid; proximal article of chelicerae weaker (Fig. 13).

MEASUREMENTS: ♂ holotype (♀ "allotype" in parentheses): Body 5.40 (5.42) long, 3.82 (3.85) wide; carapace region 1.21 (1.08) long, 2.00 (1.97) wide. - Palp and legs:

	Trochanter	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	0.74 (0.74)	1.11 (1.13)	0.84 (0.81)	0.59 (0.59)	- -	1.33 (1.36)	4.61 (4.63)
Leg I	0.57 (0.57)	1.82 (1.92)	0.86 (0.89)	0.96 (1.04)	1.65 (1.68)	0.74 (0.84)	6.60 (6.94)
Leg II	0.71 (0.71)	2.47 (2.54)	1.13 (1.18)	1.65 (1.77)	2.49 (2.56)	0.94 (1.06)	9.39 (9.82)
Leg III	0.59 (0.59)	1.87 (1.92)	0.86 (0.94)	0.99 (1.16)	2.02 (2.02)	0.44 (0.74)	6.77 (7.37)
Leg IV	0.74 (0.74)	2.42 (2.44)	1.13 (1.16)	1.68 (1.73)	3.06 (3.06)	0.74 (0.84)	9.77 (9.97)

VARIATION: Range of measurements in ♀ ♀ (n=3): Body 5.13-5.42 long, 3.40-3.85 wide, carapace region 0.96-1.08 long, 1.87-1.97 wide. The ♀ "allotype" has a more triangular genital operculum than the other specimens. Variation in the shape of eye tubercles and proximal palpal articles, see Figs 7-10.

RELATIONSHIPS: *Gnomulus bedoharvengorum* sp. n. is most closely related to *G. marginatus* from southeastern Thailand. Both species are also geographically closer to each other than to any other congener within the same species group. *Gnomulus ryssie* Schwendinger & Martens, from the western part of central Thailand, belongs to the same phylogenetic lineage and is provisionally regarded as the closest relative of *G. marginatus* and *G. bedoharvengorum* sp. n. Further *Gnomulus* populations in north-eastern Thailand (currently only known from females and juveniles; see Fig. 1 and Schwendinger & Martens, 2002: 107, fig. 1) presumably represent new species of the same lineage.

DISTRIBUTION AND HABITAT: Known from four localities (separated by up to 10 km) around Hon Chong, at the western coast of southern Vietnam (Fig. 1 [8]). This picturesque limestone area, exceptionally rich in its soil fauna, is now threatened by large-scale commercial quarrying (Bedos & Deharveng, 2000). Two specimens were collected from dark parts of limestone caves (in two hills separated by about 4 km of drained marsh), one from inside a rotten log lying in a hollow between limestone crags, and one from under dead wood near the top of a limestone hill (pers. commun. A. Bedos and L. Deharveng). After a few days without rain, soil on limestone dries quickly. Animals, such as oncopodids, that require humid conditions, then probably take temporary shelter in caves. The same presumably also holds true for *G. pulvillatus* (Pocock), the type of which has been collected in a limestone cave of peninsular Malaysia (see Schwendinger & Martens, 1999: 961-962).

THE DALAT-GROUP (NEW)

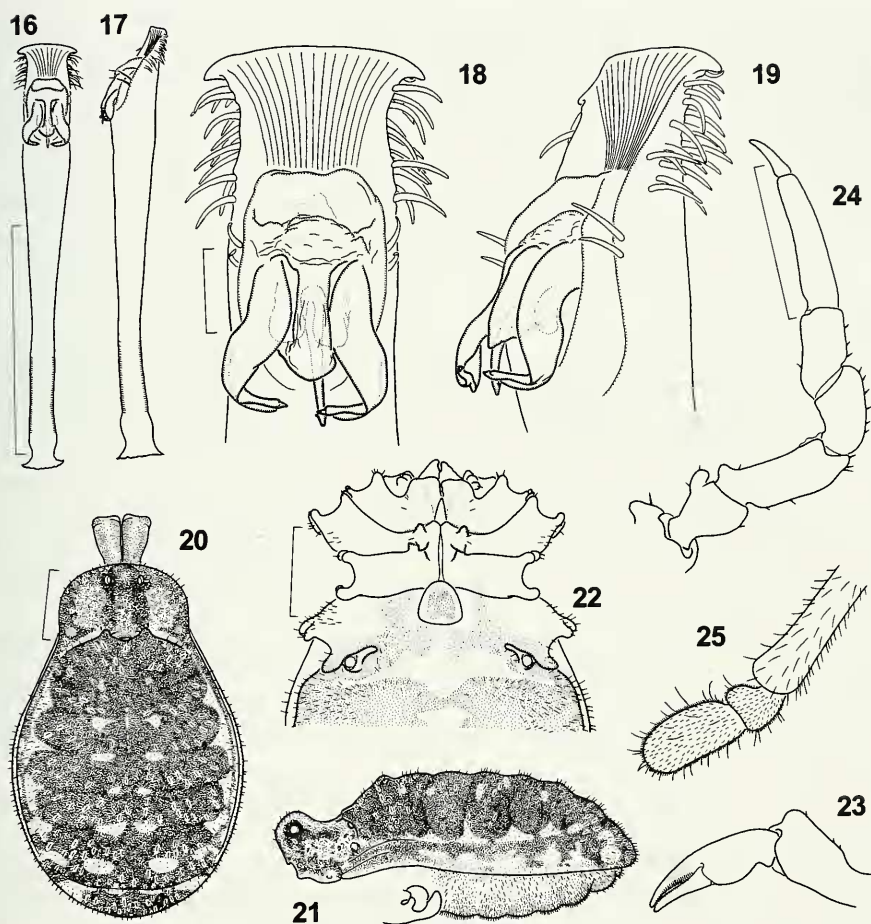
DIAGNOSIS: Medium-sized to fairly large (4.81-7.17 mm body length) species with rounded eye mound and carapace-opisthosoma bridge composed of two opposing pairs of tubercles; leg coxa I without anterolateral process; ventral side of leg coxae II and III with anteroproximal processes, coxa II with posteroproximal process; posterior margin of stigmatic pit with low tubercle, spiracles more or less clearly visible; proximal article of chelicerae without ventral process or mound; ventral process on palpal trochanter more or less distinctly distad-inclined; glans penis flanked on each side with two setae isolated from the group of subapical setae; lateral sclerites of glans penis basally concave, their inner ledges lying above the median plate, their apices somewhat blade-shaped, with pointed or more or less distinctly bifid tips inclined towards each other; membranous tubes completely covered by median plate, slender stylus penis with a bulbous base and with a pair of small subterminal teeth. This species group is close to the *asli*-group and to the *goodnighti*-group.

SPECIES ACCOUNT AND DISTRIBUTION: The *dalat*-group comprises four species from Vietnam: *Gnomulus saetosus* sp. n., *G. dalat* sp. n., *G. lemniscatus* sp. n. and *G. annamiticus* sp. n.

Gnomulus saetosus sp. n.

Figs 16-25

MATERIAL: VIETNAM (south), Dong Nai Province, Cat Tien National Park, 25 km NW of Tan Phu, trail from headquarters to Mr Dong redwood tree (11°25'22"N, 107°25'42"E), 130 m, ♂ holotype, 1 juv., leg. P. J. Schwendinger, 26.-29.VIII.2003 (MHNG; sample SV-03/14).



FIGS 16-25

Gnomulus saetosus sp. n., ♂ holotype. – Penis, dorsal (16) and lateral view (17); apex of penis, dorsal (18) and lateral view (19). Body, dorsal (20) and lateral view (21); anterior part of body, ventral view (22); left chelicera, retrolateral view (23); left palp, retrolateral view (24); distal part of left leg II, retrolateral view (25). Scale lines 0.1 mm (18, 19), 1.0 mm (all others).

ETYMOLOGY: The Latin adjective *saetosus* (= bristly, setose) refers to the unique setation of the new species.

DIAGNOSIS: Similar to *G. monticola* Schwendinger & Martens, distinguished by: Body larger, densely set with flexible spike-like setae, with different colour pattern; leg coxa I without anterolateral process; tracheal stigmata clearly visible; ventral process on palpal trochanter proximally narrower; penis with longer membranous socket with a distal dent; glans with median plate carrying a median longitudinal elevation and lateral sclerites with inner ledges lying above the lateral parts of the median plate, their apices more strongly bent and with indistinctly bifid tips.

DESCRIPTION: ♂ (holotype). Ground colour dark amber, with darker reticulation in carapace region, on palps and chelicerae, and with darker pattern in opisthosoma region of dorsal (Figs 20, 21) and ventral scutum; a subbasal black ring on each cheliceral finger; central part of genital operculum darkened; light zone distally on tibiae III, IV and medially on metatarsi III, IV; all leg tarsi light, dorsal side of tarsus I darkened, that of tarsus II cream.

Whole body quite densely covered with short, flexible, spike-like setae, these conspicuously white and broad at base on dorsal and ventral scutum.

Carapace region with low, broadly rounded eye mound; no lateral tubercles; carapace-opisthosoma bridge composed of two widely separated opposing pairs of tubercles, posterior tubercles overlapping anteriors (Figs 20, 21). Dorsal scutal areas only slightly elevated, most distinctly in posterior zone of area I, areas I-VII divided by a shallow median furrow; ventral scutal areas not swollen, densely covered by white spike-like setae (Fig. 21). Palpal coxa with rounded ventral process (bifid on right side) carrying 1-2 spike-like setae; leg coxa I without anterolateral process; ventral side of leg coxae II and III with distinct anteroproximal processes, that on coxa III overlapped by posteroproximal process on coxa II (Fig. 22); dorsal side of leg coxa IV without tubercles. Genital operculum as wide as long, with broadly rounded anterior margin. Posterior margin of stigmatic pit with a low, widely rounded tubercle, entire spiracle clearly visible (Fig. 22).

Chelicerae (Fig. 23) fairly weak; proximal article with dorsodistal to dorso-medial boss, ventral side unarmed.

Palps (Fig. 24) set with several setae on coxa to tibia; femur with conical ventroproximal process; trochanter with distad-directed, distally truncate ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II about 2.1 times longer than wide (Fig. 25).

Penis (Figs 16-19): Truncus fairly slender, with very widely arched (almost straight) distal margin and several subapical setae. Glans (Figs 18, 19) with distally quadrangular membranous socket with a dent in its distal part; strong lateral sclerites basally concave, their tapering tips pointing towards each other; median plate rounded, its median zone longitudinally elevated and partly overlapping inner margin of lateral sclerites; membranous tubes fairly large, completely covered by median plate; stylus slender, with bulbous base and a pair of small subterminal ventral teeth at apex.

♀. Unknown.

MEASUREMENTS: Body 4.81 long, 3.19 wide; carapace region 0.99 long, 1.79 wide. - Palp and legs:

	Trochanter	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	0.55	0.71	0.55	0.35	-	0.79	2.95
Leg I	0.47	1.30	0.71	0.71	1.12	0.75	5.06
Leg II	0.61	1.75	0.91	1.14	1.69	0.89	6.99
Leg III	0.47	1.34	0.73	0.75	1.38	0.55	5.22
Leg IV	0.61	1.81	0.93	1.18	2.15	0.63	7.31

JUVENILE: Body 4.10 long, 2.94 wide, presumably penultimate instar, very similar to male holotype in external morphology.

RELATIONSHIPS: *Gnomulus saetosus* sp. n. is morphologically similar and obviously closely related to *G. dalat* sp. n., more distantly so to *G. lemniscatus* sp. n.

Distribution and habitat. Known only from the type locality [Fig. 1 (7)], home of the only remaining population of the Indochinese subspecies of the Javan rhino (*Rhinoceros sondaicus annamiticus* Heude, 1892). The holotype of *G. saetosus* sp. n. was extracted from a rare accumulation of humus and leaf-litter in an evergreen rain forest that generally offers few promising sites for sifting (own observations and pers. commun. L. Deharveng). The decomposition rate of organic matter in this forest appears to be very high.

Gnomulus dalat sp. n.

Figs 26-39

MATERIAL: VIETNAM (south), Lam Dong Province, remnant forest near Datanla Waterfall, ca. 5 km S of Dalat (11°54'02"N, 108°26'54"E), 1300 m, ♂ holotype (MHNG), 6 ♂ (MAR, MHNG, MNHN, NHMW), 1 ♀ ("allotype"; MHNG) paratypes, 5 juveniles, leg. P. J. Schwendinger, 5./11./12.IX.2003 (samples SV-03/20, SV-03/24).

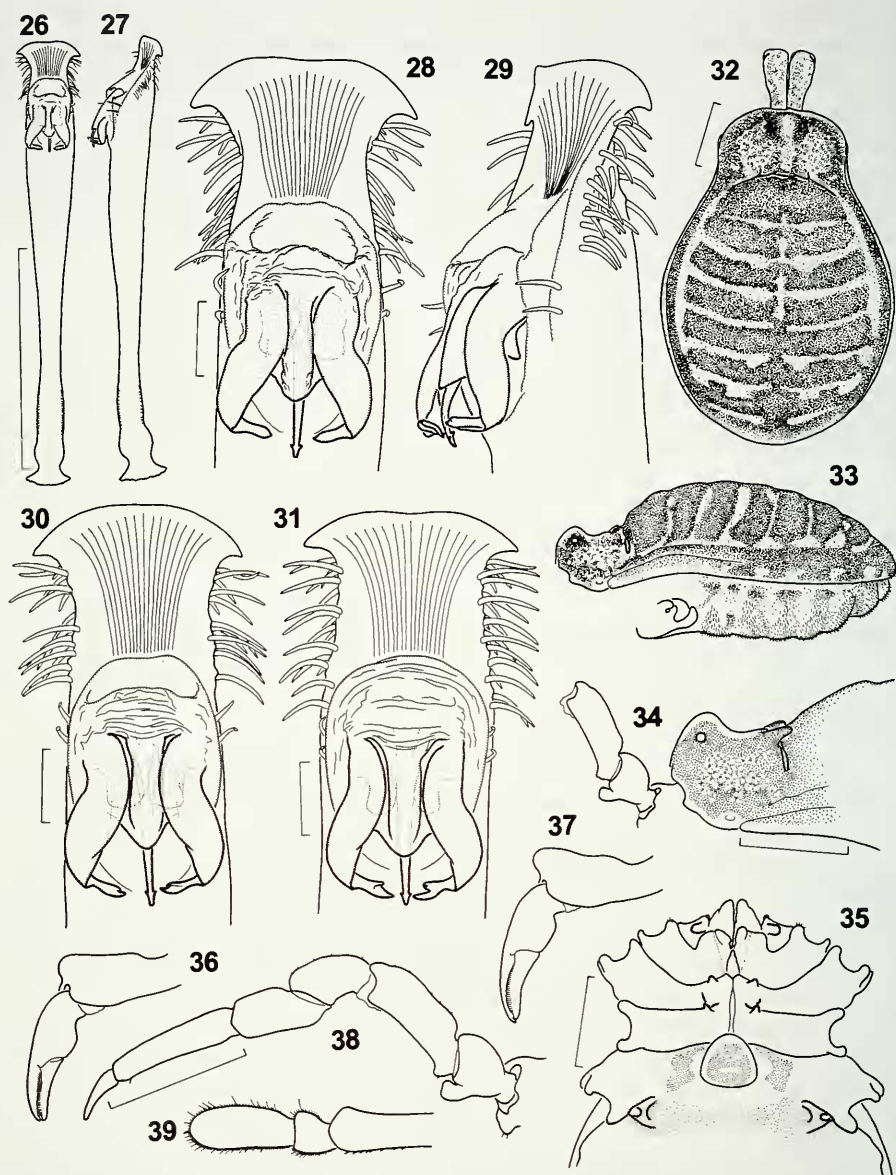
ETYMOLOGY: The species name, an invariable noun in apposition, refers to the city of Dalat, Vietnam's honeymoon capital, which lies close to the type locality.

DIAGNOSIS: Similar to *G. saetosus* sp. n., distinguished by: Body set with fewer, finer and much shorter setae; anterior processes of carapace-opisthosoma bridge overlapping posterior counterparts; areas in opisthosoma region of dorsal scutum less elevated; ventral process on palpal trochanter more broadly truncate distally; glans penis with wider membranous base and more V-shaped median plate, tips of lateral sclerites different in shape.

DESCRIPTION: ♂ (holotype). Ground colour amber, with darker reticulation in carapace region, on chelicerae and pedipalps. Opisthosoma region of dorsal scutum with dark margin and dark transversal bands (partly broken medially in areas I-IV) (Fig. 32). Opisthosoma region of ventral scutum with slightly darker transversal bands on low scutal elevations, partly broken in areas V-VII, completely broken in other areas. Legs with darker distal zone on all metatarsi, darker basal zone on all femora and on tibia IV; tarsi light amber (tarsus II lightest), tarsus I cream ventrally. Ventral side of prosoma light amber, with greyish pattern.

Carapace region with moderately elevated, rounded eye mound; no lateral tubercles; carapace-opisthosoma bridge composed of an anterior pair of tubercles overlapping a posterior pair of short, wide lobes (Figs 32, 33). Dorsal scutal areas indistinctly elevated, most pronounced in posterior zone of area I and in areas VI and VII; ventral scutal areas not swollen, covered by white setae (Fig. 33). Palpal coxa with short rounded ventral process; leg coxa I without anterolateral process; ventral side of leg coxae II and III with small, conical anteroproximal processes; more rounded posteroproximal process on coxa II touching process on coxa III (Fig. 35); dorsal side of leg coxa IV without tubercles. Genital operculum slightly wider than long, with broadly rounded anterior margin. Posterior margin of stigmatic pit with a low rounded tubercle, spiracle largely visible (Fig. 35).

Chelicerae (Fig. 36) fairly weak; proximal article with distinct dorsodistal and lower dorsomedian boss, ventral side unarmed.



FIGS 26-39

Gnomulus dalat sp. n., ♂ holotype (30, 32, 33, 35, 36, 38, 39), ♂ paratype (26-29, 31), ♀ "allotype" (34, 37). — Penis, dorsal (26) and lateral view (27); apex of penis, dorsal (28, 30, 31) and lateral view (29). Body, dorsal (32) and lateral view (33); anterior part of body and proximal part of palp, lateral view (34); anterior part of body, ventral view (35); left chelicera, retrolateral view (36, 37); left palp, retrolateral view (38); distal part of left leg II, retrolateral view (39). Scale lines 0.1 mm (28-31), 1.0 mm (all others).

Palps (Fig. 38) carrying a few very short setae, longest those on coxal process and ventrodistally on tarsus; tibia with distinct ventroproximal boss; femur with low, rounded ventroproximal process; trochanter with broadly truncate, distad-directed ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II about 2.4 times longer than wide (Fig. 39).

Penis (Figs 26-31; holotype Fig. 30): Truncus fairly slender, narrowest diameter above proximal 1/4, widest below glans; distal margin widely rounded and slightly invaginated; several subapical setae present, 2 pairs of setae flanking glans base. Membranous socket of glans (Figs 28, 30, 31) as wide as truncus penis at that point, somewhat oval in dorsal view, with a dent in its distal part; lateral sclerites basally concave, its indistinctly bifid tips pointing towards each other; median plate somewhat V-shaped, its longitudinal median zone elevated; membranous tubes fairly large and distally truncate, completely covered by median plate; stylus slender, with bulbous base and a pair of small subterminal ventral teeth at apex.

♀. As in ♂, except for: Ventral scutal elevations slightly less elevated, set with fewer setae. Dorsodistal boss on chelicera slightly more prominent (Fig. 37); ventral processes on palpal trochanter and femur slightly smaller (Fig. 34); metatarsus II darker throughout; tarsus II cream; genital operculum and transversal bands in opisthosoma region of ventral scutum darker; opisthosomal areas I-IV of dorsal scutum only indistinctly broken medially.

MEASUREMENTS: ♂ holotype (♀ "allotype" in parentheses): Body 4.90 (4.94) long, 3.48 (3.50) wide; carapace region 0.97 (0.99) long, 1.90 (1.88) wide. - Palp and legs:

	Trochanter	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	0.55 (0.53)	0.75 (0.75)	0.55 (0.55)	0.41 (0.40)	- -	0.87 (0.85)	3.13 (3.08)
Leg I	0.53 (0.49)	1.38 (1.34)	0.73 (0.73)	0.75 (0.75)	1.26 (1.26)	0.81 (0.71)	5.46 (5.28)
Leg II	0.63 (0.61)	1.86 (1.74)	0.97 (0.93)	1.24 (1.19)	1.90 (1.86)	0.99 (0.89)	7.59 (7.22)
Leg III	0.49 (0.49)	1.38 (1.38)	0.77 (0.75)	0.83 (0.83)	1.54 (1.54)	0.59 (0.55)	5.60 (5.54)
Leg IV	0.63 (0.63)	1.94 (1.86)	0.97 (0.95)	1.32 (1.30)	2.27 (2.25)	0.71 (0.67)	7.84 (7.66)

RELATIONSHIPS: Strong similarities between *G. dalat* sp. n. and *G. saetosus* sp. n. in genital morphology, rather than in external morphology, indicate a sister relationship. *Gnomulus lemniscatus* sp. n. obviously belongs to the same phylogenetic lineage but appears distant from the former two species by possessing a strongly modified apex penis.

VARIATION: The ♀ has a reduced anteroproximal process on its left leg coxa III and a deformed left leg II, i.e. its distitarsus is budding directly from the tibia. One ♂ paratype has the anteroproximal processes of both leg coxae III reduced and not in contact with the posteroproximal processes on coxae II. In two ♂ paratypes the distal margin of the truncus penis is medially slightly invaginated (Figs 28, 31); in one ♂ paratype the membranous base of the glans penis has no dent in its distal part and the tips of its lateral glans sclerites are more distinctly bifid than in the other two males examined (Fig. 31, cf. Figs 28, 30). Range of body measurements in ♂♂ (n=7): total length 4.74-5.14, width 3.40-3.75, length of carapace region 0.97-1.07, width 1.82-2.05.

DISTRIBUTION AND HABITAT: Known only from the type locality (Fig. 1[6]). The specimens were collected by sifting deep and humid leaf litter in a remnant patch of evergreen hill forest near a waterfall heavily frequented by tourists. The surrounding landscape is dominated by pine forests planted by the French. The specimens examined turned up in the same samples as specimens of *G. lemniscatus* sp. n. This is the first case of syntopic occurrence of oncopodid species belonging to the same species group.

***Gnomulus lemniscatus* sp. n.**

Figs 40-53

MATERIAL: VIETNAM (south), Lam Dong Province, remnant forest near Datanla Waterfall, ca. 5 km S of Dalat (11°54'02"N, 108°26'54"E), 1300 m, ♂ holotype, ♀ paratype ("allotype"), leg. P. J. Schwendinger, 5./11./12.IX.2003 (MHNG, sample SV-03/20).

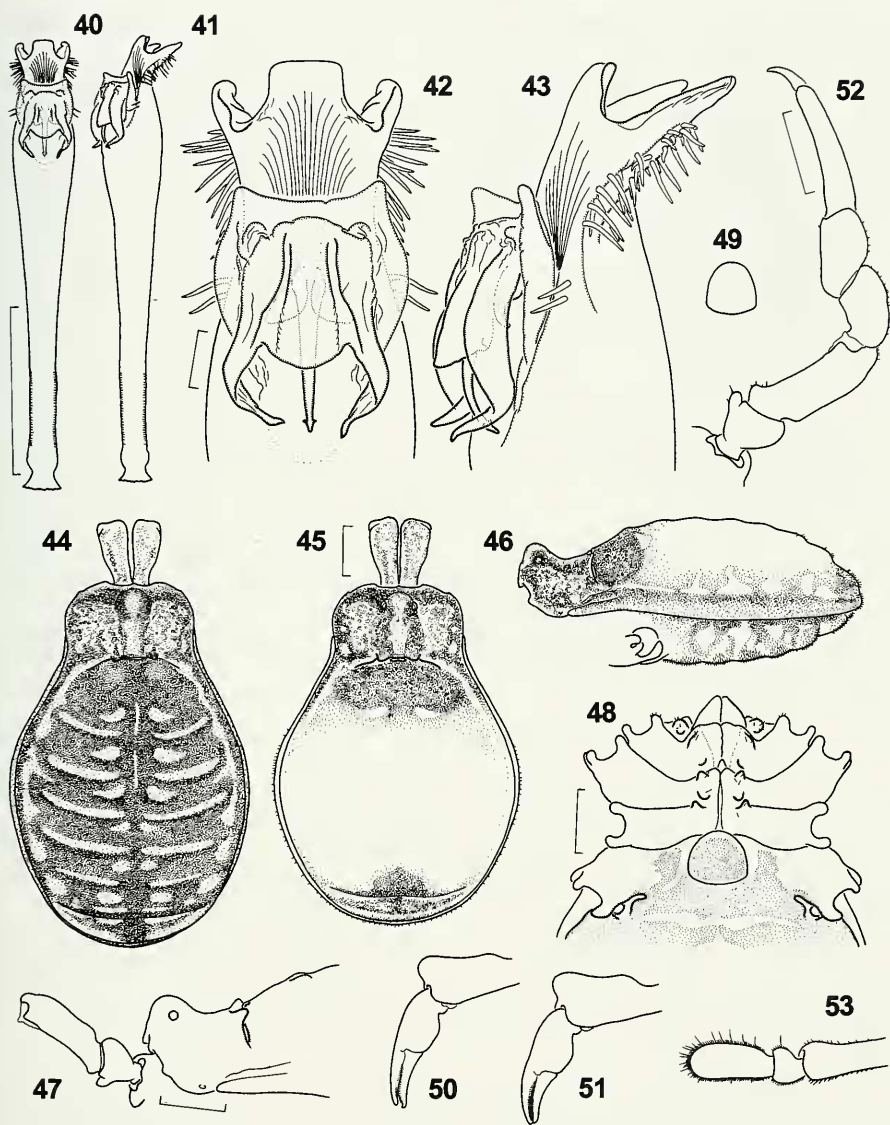
ETYMOLOGY: The Latin adjective *lemniscatus*, *-a*, *-um* (= ornamented with bands) refers to the colour pattern in the carapace region of the new species.

DIAGNOSIS: Similar to *G. saetosus* sp. n., distinguished by: Body larger, set with finer setae; anterior processes of carapace-opisthosoma bridge overlapping posterior processes; posteroproximal process on coxa II not in contact with anteroproximal process on coxa III; proximal article of chelicerae with larger dorsodistal boss; genital operculum and opisthosoma region of dorsal scutum wider in males; penis stouter, with strongly modified apex; glans penis with larger membranous base, shorter median plate and weaker lateral sclerites with less bent apices.

DESCRIPTION: ♂ (holotype). Ground colour amber, with darker reticulation in lateral parts of carapace region, on chelicerae and palpal trochanters; a light median longitudinal band running over eye mound to carapace-opisthosoma bridge. Opisthosoma region of dorsal scutum with dark margin, dark pattern in its centre destroyed by ultrasonic treatment (Fig. 45), originally similar to that of female (Fig. 44). Opisthosoma region of ventral scutum with dark transversal bands on low scutal elevations mottled with lighter dots (possibly gland ducts). Legs mostly dark reddish brown; metatarsus II darkest; median part of metatarsi III, IV and distal part of tibia IV lighter; tarsi I, III, IV light amber, tarsus II cream. Ventral side of prosoma light amber with greyish pattern.

Carapace region with distinctly elevated, rounded eye mound; no lateral tubercles; carapace-opisthosoma bridge composed of two opposing pairs of tubercles, anterior ones overlapping posteriors (Figs 45, 46). Dorsal scutal areas of opisthosoma indistinctly elevated, most pronounced in posterior zone of area I and in areas VI and VII; ventral scutal areas not swollen, covered by white setae (Fig. 46). Palpal coxa with rounded ventral process; leg coxa I without anterolateral process; ventral side of leg coxae II and III with small anteroproximal processes; posteroproximal process on coxa II not overlapping process on coxa III (Fig. 48); dorsal side of leg coxa IV without tubercles. Genital operculum wider than long, with broadly rounded anterior margin. Posterior margin of stigmatic pit with a low rounded tubercle, spiracle partly visible (Fig. 48).

Chelicerae (Fig. 51) fairly weak; proximal article with distinct dorsodistal and lower dorsomedian boss, ventral side unarmed.



Figs 40-53

Gnomulus lemniscatus sp. n., ♂ holotype (40-43, 45, 46, 48, 51-53), ♀ "allotype" (44, 47, 49, 50). – Penis, dorsal (40) and lateral view (41); apex of penis, dorsal (42) and lateral view (43). Body, dorsal (44, 45) and lateral view (46); anterior part of body and proximal part of palp, lateral view (47); anterior part of body, ventral view (48); genital operculum (49); left chelicera, retrolateral view (50, 51); left palp, retrolateral view (52); distal part of left leg II, retrolateral view (53). Scale lines 0.1 mm (42, 43), 1.0 mm (all others).

Palps (Fig. 52) carrying a few setae on coxa to tibia; tibia with distinct ventroproximal boss; femur with low, conical ventroproximal process; trochanter with more rounded, distad-directed ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II about 2.3 times longer than wide (Fig. 53).

Penis (Figs 40-43): Truncus fairly slender basally, distinctly widening below glans; distal margin strongly modified, with a subquadrangular median part separated by deep incisions from a lateral pair of long, ventrodistad-directed lobes; subapical lateral setae in 2 groups, a distal group of several setae and a proximal group of only 2 setae at height of glans base. Glans (Figs 42, 43) with a large, shield-shaped membranous socket with a broadly invaginated distal margin, wider than truncus at that point; lateral sclerites basally concave and with elevated inner ridges, tapering tips of lateral sclerites moderately bent towards each other; median plate short, broadly rounded, longitudinal median zone elevated; membranous tubes fairly small, completely covered by median plate; stylus slender, with bulbous base and a pair of small subterminal ventral teeth at apex.

♀. As in ♂ except for: Eye mound more rounded; ventral processes on palpal trochanter and femur slightly smaller (Fig. 47). Opisthosoma region of dorsal scutum with a broken thin, light, longitudinal median stripe in areas I-III, dark pattern in scutal areas with light, medially broken transversal bands alternating with light paramedian spots (Fig. 44). Anteroproximal processes on coxae II and III slightly larger, but also not touching each other. Genital operculum longer than wide (Fig. 49). Transversal bands on ventral scutal elevations less distinctly mottled with lighter dots.

MEASUREMENTS: ♂ holotype (♀ "allotype" in parentheses): Body 6.51 (7.17) long, 4.78 (4.68) wide; carapace region 1.38 (1.38) long, 2.54 (2.51) wide. - Palp and legs:

	Trochanter	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	0.79 (0.76)	1.33 (1.28)	0.91 (0.89)	0.62 (0.59)	- -	1.53 (1.48)	5.18 (5.00)
Leg I	0.68 (0.69)	2.17 (2.07)	1.08 (1.04)	1.28 (1.23)	2.05 (2.00)	1.06 (1.06)	8.33 (8.09)
Leg II	0.89 (0.89)	2.81 (2.76)	1.43 (1.38)	2.02 (1.94)	3.01 (2.98)	1.33 (1.31)	11.49 (11.26)
Leg III	0.69 (0.69)	2.12 (2.07)	1.08 (1.08)	1.33 (1.28)	2.37 (2.34)	0.81 (0.79)	8.40 (8.25)
Leg IV	0.91 (0.94)	2.91 (2.91)	1.45 (1.43)	2.12 (2.07)	3.50 (3.45)	0.99 (0.94)	11.88 (11.74)

REMARK: Both specimens examined are crippled. The male lacks the right palpal tarsus (the claw sits on the tibia) and the female has a weak left leg I with a strong constriction (probably an old wound acquired in the previous instar) on the metatarsus.

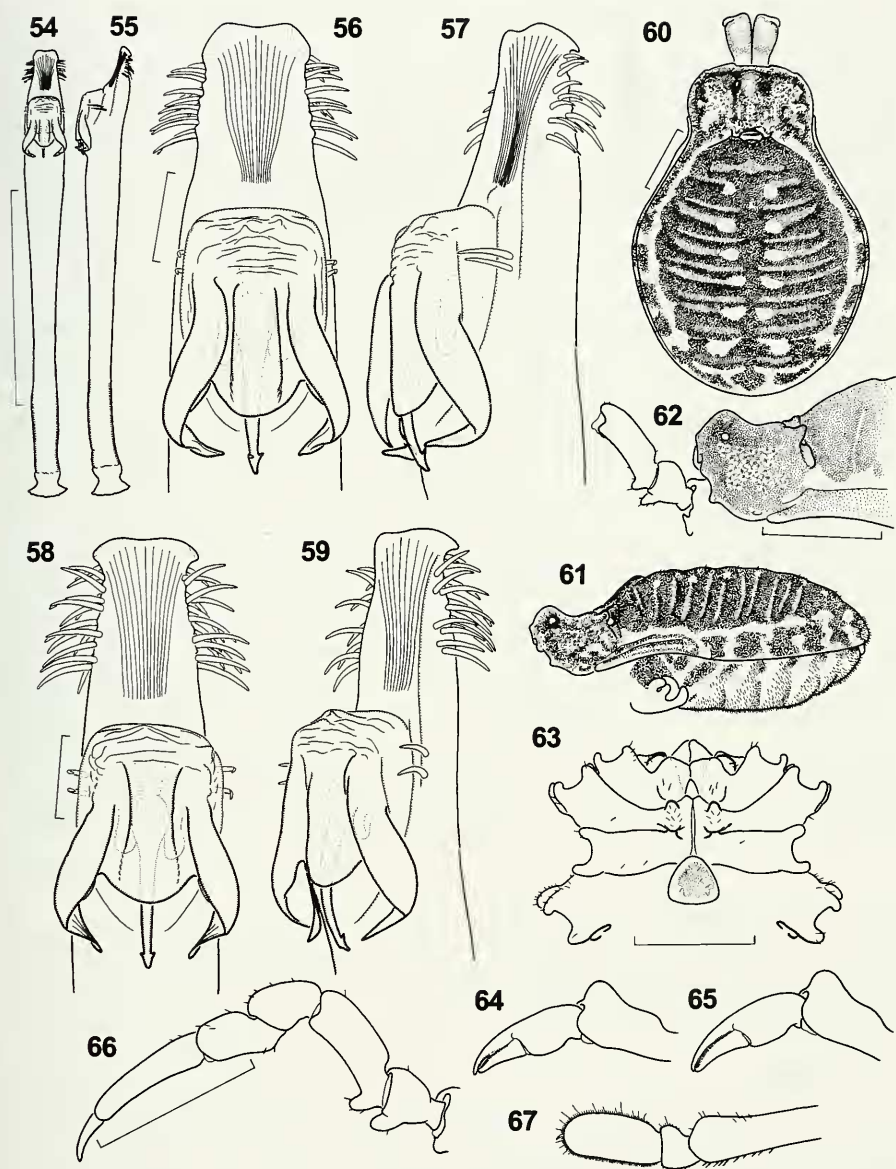
RELATIONSHIPS: Judging from modifications (though quite different in shape) of the apex penis and the presence of small membranous tubes in the glans penis in *G. lemniscatus* sp. n. and *G. annamiticus* sp. n. (described below), we consider these two species more closely related to each other than to the other members of this species group.

DISTRIBUTION AND HABITAT: Known only from the type locality, which is also the type locality of *G. dalat* sp. n. (habitat description see there) [Fig. 1 (6)].

Gnomulus annamiticus sp. n.

Figs 54-67

MATERIAL: VIETNAM (north), Thua Thien Hue Province, Bach Ma National Park, Mount Bach Ma: ♂ holotype (MHNG; ex NSMT-Ad, donated by H. Ono), 1 ♀ paratype ("allotype") (NSMT-Ad 206-207), 1300 m; 1 ♂ paratype, 1 juv. (NSMT-Ad 208-209), 1250-1400 m; all leg. S. Nomura, 8.VI.2002.



FIGS 54-67

Gnomulus annamiticus sp. n., ♂ holotype (54-57, 60, 61, 63, 64, 66, 67), ♂ paratype (58, 59), ♀ "allotype" (62, 65). — Penis, dorsal (54) and lateral view (55); apex of penis, dorsal (56, 58) and lateral view (57, 59). Body, dorsal (60) and lateral view (61); anterior part of body and proximal part of palp, lateral view (62); anterior part of body, ventral view (63); left chelicera, retrolateral view (64, 65); left palp, retrolateral view (66); distal part of left leg II, retrolateral view (67). Scale lines 0.1 mm (56-59), 1.0 mm (all others).

ETYMOLOGY: Latin adjective of Annam, the old (Chinese) name of central Vietnam.

DIAGNOSIS: Similar to *G. lemniscatus* sp. n., distinguished by: Different colour pattern; posteroproximal process on leg coxa II in contact with anteroproximal process on coxa III; ventroproximal process on palpal femur distinctly larger; genital operculum more triangular in shape; penis more slender, with an undivided, longer and narrower apex; glans penis with smaller membranous base, stronger lateral sclerites and a more distinctly elevated longitudinal median zone on the median plate.

DESCRIPTION: ♂ (holotype). Ground colour orange-amber, with darker reticulation in lateral parts of carapace region, proximal chelicerae and palpal trochanters to tibiae. Dorsal scutum with dark margin fragmented in posterior half, and with dark pattern in opisthosoma region interspersed with light transversal stripes and light paramedian spots (Figs 60, 61). Ventral scutum lighter, with less distinct dark pattern in opisthosoma region. Legs mostly dark brown; light zones distally on all patellae and on tibiae III, IV, medially on metatarsi II, IV; tarsi III, IV light amber, tarsus II cream, tarsus I cream ventrally and light amber dorsally.

Carapace region with rounded eye mound; no lateral tubercles (Fig. 61); carapace-opisthosoma bridge composed of two opposing pairs of tubercles, anterior tubercles overlapping posteriors (Fig. 60). Dorsal scutal areas indistinctly elevated, most pronounced in posterior zone of area I and in area VII; ventral scutal areas not swollen, densely set with white setae (Fig. 61). Palpal coxa with rounded ventral process; leg coxa I without anterolateral process; ventral side of leg coxae II and III with small anteroproximal processes; posteroproximal process on coxa II overlapping process on coxa III (Fig. 63); dorsal side of leg coxa IV without tubercles. Genital operculum slightly wider than long, somewhat triangular in shape. Posterior margin of stigmatic pit without tubercle, spiracle not visible (Fig. 63).

Chelicerae (Fig. 64) fairly weak; proximal article with distinct dorsodistal and lower dorsomedian boss, ventral side unarmed.

Palps (Fig. 66) carrying a few setae on coxa to tibia; tibia with low ventroproximal boss; femur with strong ventroproximal process; trochanter with equally strong, slightly distad-directed ventral process.

Legs 1324, tarsal formula 2-2-3-3. Distitarsus of leg II about 2.2 times longer than wide (Fig. 67).

Penis (Figs 54-59; 54-57 holotype): Truncus fairly slender, with an irregular subbasal ring fold, the portion distal to it with a series of quite distinct, fine annulations (also present but less distinct in many other *Gnomulus* spp.), followed by a narrower portion distally widening to a point below the glans and then narrowing again to the apex; apex long and narrow; distal margin slightly and widely invaginated, its lateral corners bent ventrally; subapical setae in 2 widely separated groups, a distal group of several setae and a group of 2 setae at height of glans base. Membranous socket of glans (Figs 56, 58) slightly narrower than truncus penis at that point, with straight distal margin; lateral sclerites basally concave, their inner edges lying above median plate, their tips tapering and bent towards each other; median plate short, broadly rounded, longitudinal median zone elevated; membranous tubes small, completely covered by

median plate; stylus slender, with bulbous base and a pair of small subterminal ventral teeth at apex.

♀ (newly moulted specimen). As in ♂ except for: Ground colour paler, dark parts more greyish, light transversal stripes in opisthosoma region of dorsal scutum more distinct; dark pattern on ventral scutum more pronounced; tarsi I, III, IV with grey patches dorsally; ventral scutal areas slightly less elevated, not so densely covered with setae; spiracles partly visible; ventral process on palpal femur clearly smaller (Fig. 62). Chelicerae (Fig. 65) as in male.

MEASUREMENTS: ♂ holotype (♀ “allotype” in parentheses): Body 6.18 (7.06) long, 4.35 (4.96) wide; carapace region 1.28 (1.38) long, 2.32 (2.47) wide. - Palp and legs:

	Trochanter	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	0.72 (0.77)	0.99 (1.06)	0.72 (0.77)	0.52 (0.52)	- -	1.16 (1.28)	4.11 (4.40)
Leg I	0.67 (0.74)	1.78 (1.85)	0.96 (1.04)	0.96 (1.06)	1.58 (1.70)	0.91 (1.04)	6.86 (7.43)
Leg II	0.84 (0.89)	2.35 (2.45)	1.28 (1.36)	1.53 (1.70)	2.35 (2.52)	1.19 (1.31)	9.54 (10.23)
Leg III	0.69 (0.72)	1.78 (1.83)	1.01 (1.06)	1.04 (1.16)	1.88 (2.05)	0.79 (0.89)	7.19 (7.71)
Leg IV	0.89 (0.89)	2.52 (2.59)	1.33 (1.38)	1.75 (1.88)	2.96 (3.19)	0.91 (1.06)	10.36 (10.99)

VARIATION: Range of body measurements in ♂♂ (n=2): Total length 6.18-6.27, width 4.35-4.45; length of carapace region 1.28, width 2.32. Spiracles are partly visible in both paratypes, but not in the holotype. The membranous base of the glans penis in the ♂ paratype is wider (narrower in the holotype; Fig. 56) than the truncus penis at that point (Fig. 58); the subbasal ring fold on the truncus penis of this ♂ is less distinct than in the holotype.

RELATIONSHIPS: Relatively large size, small membranous tubes of the glans penis and modification of the apex penis indicate that *G. annamiticus* sp. n. and *G. lemniscatus* sp. n. are more closely related to each other than to the other two species of this group.

DISTRIBUTION AND HABITAT: Known only from an evergreen hill forest on the rugged Mount Bach Ma (1448 m), in the central part of Vietnam, only 18 km from the coast of the South China Sea [Fig. 1 (5)]. This is one of the wettest areas of Vietnam. The summit of the mountain receives a mean annual rainfall of about 8000 mm, most of it between September and November.

THE *SINENSIS*-GROUP

DIAGNOSIS: See Schwendinger & Martens (2002: 50).

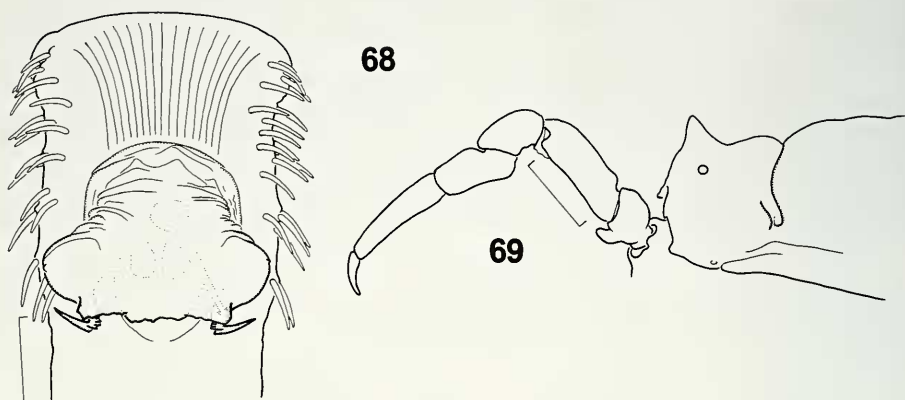
DISTRIBUTION AND SPECIES ACCOUNT: This species group is currently known only from two species, *G. sinensis* Schwendinger & Martens and *G. spiniceps* Schwendinger & Martens, recorded from two localities in Sichuan Province, China, and from Cuc Phuong National Park in northern Vietnam, respectively.

Gnomulus spiniceps Schwendinger & Martens

Figs 68-69

Gnomulus spiniceps Schwendinger & Martens, 2002: 51-55, figs 10-18 (description of ♂).

NEW MATERIAL: VIETNAM, Ninh Binh Province, Cuc Phuong National Park (the type locality), 150 m, 1 ♂ (MHNG, ex NSMT-Ad, donated by H. Ono), leg. S. Nomura, 14.VI.2002.



Figs 68-69

Gnomulus spiniceps Schwendinger & Martens, male from Cuc Phuong. – Apex of penis, dorsal view (68); anterior part of body and palp, lateral view (69). Scale lines 0.1 mm (68), 1.0 mm (69).

DIAGNOSIS AND DESCRIPTION OF ♂ HOLOTYPE: See Schwendinger & Martens (2002).

DISTRIBUTION: Known only from 450 m and 150 m altitude at the type locality, Cuc Phuong National Park in northern Vietnam (Fig. 1 [4]).

REMARKS: The newly collected specimen measures: Body 5.58 long, 4.12 wide, carapace region 1.46 long, 2.37 wide; distitarsus II about 2.0 times longer than wide. Its body is slightly larger than that of the holotype (NSMT-Ad 174), its eye tubercle slightly shorter (Fig. 69) and its penis apically slightly wider, with a less arched distal margin (Fig. 68).

Gnomulus sinensis Schwendinger & Martens

Figs 70-74

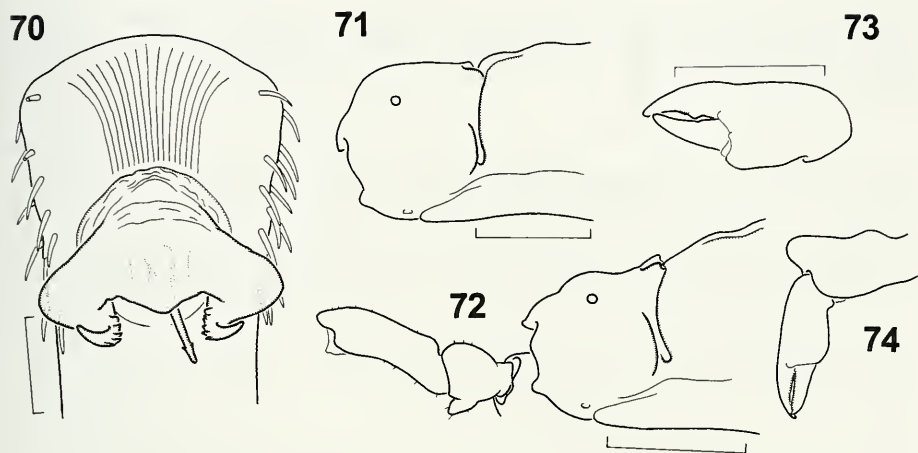
Gnomulus sinensis Schwendinger & Martens, 2002: 50-51, figs 2-9 (description of ♂).

NEW MATERIAL: CHINA, Sichuan Province, Tuanjie Village (30°25.126'N, 102°44.380'E), 1100 m, Wulong Town, near Baoxing (= Paohing), 1 ♂, 1 juv. (SMF), 1 ♀ (MHNG, donated by P. Jäger), leg. P. Jäger, 28.VI.2004.

DIAGNOSIS AND DESCRIPTION OF ♂ HOLOTYPE: See Schwendinger & Martens (2002).

DESCRIPTION OF ♀. As in ♂ but carapace region of dorsal scutum lower and relatively smaller, with a slightly elevated, widely rounded interocular mound (Fig. 72, cf. Fig. 71 and Schwendinger & Martens, 2002: fig. 9C); ventral scutal elevations slightly less distinct; chelicerae distinctly weaker, cutting edge of its fixed finger without widely triangular tooth (Fig. 74, cf. Fig. 73 and Schwendinger & Martens, 2002: fig. 6).

VARIATION: The specimens examined measure (male holotype/new male/female): Body 4.32/4.49/4.63 long, 3.29/3.35/3.50 wide, carapace region 1.06/1.23/0.96 long, 2.00/2.05/1.87 wide. The newly collected male has stronger chelicerae, a longer



FIGS 70-74

Gnomulus sinensis Schwendinger & Martens, male (70, 71, 73) and female (72, 74) from Baoxing. – Apex of penis, dorsal view (70); anterior part of body (71); anterior part of body and proximal part of palp, lateral view (72); chela of left chelicera, retrolateral view (73); left chelicera, retrolateral view (74). Scale lines 0.1 mm (70), 1.0 mm (all others).

and higher carapace region (Fig. 71, cf. Schwendinger & Martens, 2002: fig. 9C), a slightly wider apex penis and a slightly shorter median glans plate (Fig. 70, cf. Schwendinger & Martens, 2002: fig. 4) than the male holotype.

DISTRIBUTION AND HABITAT: This species is known from two localities in Sichuan Province separated by about 100 km [Fig. 1 (1, 2)]. All specimens were sifted from forest leaf litter.

UNIDENTIFIED MATERIAL

VIETNAM (north), Vinh Phu Province, Tam Dao (Fig. 1 [3]), 950 m, 1 juv. (NSMT-Ad 211); 3.97 mm body length, still with 2 tarsal articles on legs III, IV), 17.VI.1997, leg. S. Nomura. This juvenile specimen is similar to the male holotype of *G. spiniceps* described from Cuc Phuong National Park in Ninh Binh Province, but differs by its colour pattern and by a much lower, more rounded eye tubercle. We assume that it belongs to an undescribed *Gnomulus* species.

DISCUSSION

RELATIONSHIPS AND ZOOGEOGRAPHY

Gnomulus armillatus-group. This is the most species-rich (21 spp.) and most widely distributed (within the triangle Thailand - Java - Palawan) species group in this genus. Given the large body size and similar external and penis morphology, this species group is intermediate between the *aborensis*-group from Nepal, northeastern India and northern Thailand, and the *tuberculatus*-group from Sumatra. *Gnomulus bedoharvengorum* sp. n. is the first representative of this species group recorded from

Indochina. It occurs at the southwestern corner of Vietnam (Fig. 1 [8]), about 320 km away from its closest relative, *G. marginatus*, which was described from two localities in southeastern Thailand (Fig. 1 [9, 10]). These or related species may occur in western Cambodia as well.

Gnomulus dalat-group. This newly described species group, so far known only from Vietnam (Fig. 1 [5-7]), appears to be a morphological link between the *asli*-group in peninsular Malaysia and the *goodnighti*-group in the Philippines (and in Brunei?). Species in these three groups all have small to medium-sized bodies, a low and rounded eye mound, a distad-inclined process on the palpal trochanter, and display very little sexual dimorphism in external morphology. In its penis morphology the *dalat*-group is somewhat intermediate between the other two groups mentioned. Its glans penis is fairly uniform as in the *asli*-group but differs in general shape. The apex of the truncus penis, however, is distinctly modified in two species of the *dalat*-group; comparable modifications are only known from a few species in the *goodnighti*-group. The latter two species groups are thus clearly more derived than the *asli*-group and it is conceivable that the *goodnighti*-group is a highly diversified offshoot of the *dalat*-group. The four species of the *dalat*-group can be separated into two pairs of closely related species: 1. *G. saetosus* sp. n. and *G. dalat* sp. n., smaller and with a normal apex penis, and 2. *G. lemniscatus* sp. n. and *G. annamiticus* sp. n., larger and with a modified apex penis.

Most remarkable is the syntopic occurrence of *G. dalat* sp. n. and *G. lemniscatus* sp. n. (Fig. 1 [6]). This is the first reported case of two oncopodid species from the same species group that coexist in the same biotope. There is possibly another such case, represented by two small species of the *asli*-group at a locality near Kuantan in peninsular Malaysia. However, in the latter case one of the species involved is currently known only from females and thus cannot be clearly assigned to a species group (Schwendinger & Martens, in prep.).

Gnomulus sinensis-group. The newly discovered ♀ of *G. sinensis* shows a similar external sexual dimorphism as present in the *aborensis*-group: The chelicerae of this specimen are distinctly weaker than in males and its carapace region is smaller and shows an indistinct eye mound. Together with other similarities in external morphology and in penis morphology [especially between *G. aborensis* (Roewer) (cf. Schwendinger & Martens, 1999: figs 2-7) and *G. sinensis*] this suggests a very close relationship between the *sinensis*-group and the *aborensis*-group. Both species groups are found at the northern periphery of the known distribution area of the genus *Gnomulus* and of the family Oncopodidae (see Fig. 1 [1, 2, 4] for the *sinensis*-group).

ACKNOWLEDGEMENTS

We gratefully acknowledge loans and donations of specimens from the following colleagues: Anne Bedos and Louis Deharveng (MNHN), Le Chong Man (National University of Ho Chi Minh City, Vietnam), Peter Jäger (SMF) and Hirotsugu Ono (NSMT). Bedos and Deharveng also provided valuable information on collecting sites in Vietnam. Christine Lehmann-Graber (Geneva) elaborated the habitus drawings, Jürgen Gruber (NHMW) commented on the manuscript, and John Hollier (MHNG)

checked the English text. The German Academic Exchange Service (Deutscher Akademischer Austauschdienst, Bonn) supported PJS with a 1-month research grant at the beginning of this project.

REFERENCES

- BEDOS, A. & DEHARVENG, L. 2000. Un nouveau Collembola Neanurinae du Sud du Vietnam, *Blasconura batai* sp. n., avec une clé des espèces du genre (Collembola: Neanuridae). *Revue suisse de Zoologie* 107 (2): 351-357.
- MARTENS, J. & SCHWENDINGER, P. 1998. A taxonomic revision of the family Oncopodidae I. New genera and new species of *Gnomulus* Thorell (Opiliones, Laniatores). *Revue suisse de Zoologie* 105 (3): 499-555.
- SCHWENDINGER, P. J. & MARTENS, J. 1999. A taxonomic revision of the family Oncopodidae II. The genus *Gnomulus* Thorell (Opiliones, Laniatores). *Revue suisse de Zoologie* 106 (4): 945-982.
- SCHWENDINGER, P. J. & MARTENS, J. 2002. A taxonomic revision of the family Oncopodidae III. Further new species of *Gnomulus* Thorell (Opiliones, Laniatores). *Revue suisse de Zoologie* 109 (1): 47-113.